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(54) ELECTRIC CABLES

(71) We, BICC LIMITED, (formerly BRITISH INSULATED CABLES LIMITED), a British Company, of 21 Bloomsbury Street, London, W.C.1., B3 QN do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to multiconductor electric cables, especially but not exclusively telecommunication cables, of the kind having an external sheath of translucent or transparent plastics material. Such sheath
 15 may be applied directly over a cable core comprising the insulated conductors, or it may form an outer jacket over an armoured or metal sheathed cable, or be applied over a paper tape lapping or over a metal/
 20 plastics laminate foil, as for example an aluminium/polyethylene or aluminium/ethylene copolymer laminate moisture barrier in which case it will adhere to the plastics coating forming the external surface of the laminate.

25 It is desirable to mark cables with indicia to indicate various characteristics, for example the type of cable, the manufacturer, the date of manufacture or to provide a
 30 length scale for checking the length supplied and/or to indicate the length remaining on a stock reel and/or to assist in locating any fault that may occur in the cable, preferably in such a way that the marks
 35 are observable without having to cut open the cable sheath.

40 Markings can be embossed on the cable sheath, but they are liable to be obliterated by abrasion during laying, especially if the cables are drawn in long lengths into closely-fitting ducts, whereas separately inserted marking tapes can prove undesirable.

45 In accordance with the invention, in an electric cable having an external sheath of transparent or translucent plastics material,

markings are directly printed upon a surface of a functional component of the cable so as to be visible through the said external sheath. The term "printed" is used herein in a broad sense to indicate all methods of
 50 marking in which visually distinctive material, such as an ink or a paint, is applied to form indicia on the said functional component (by which is meant a component having a specific electrical or
 55 mechanical function in addition to carrying the markings). In a preferred form of the invention, the functional component is a moisture barrier foil; in most other cases it will be a lapping tape.

60 The markings may be applied in-line with another cable manufacturing process; thus a tape (forming the functional component) may be marked and then applied to the cable core (or to an interposed layer
 65 thereon), or a tape may be applied and marked *in situ*, in-line with the laying-up of the core (i.e. the assembly of the insulated conductors) or the formation of the interposed layer as the case may be, and/or in-line with the application of the external
 70 translucent or transparent sheath. Alternatively a tape may be marked in advance, preferably either when tapes are formed by slitting sheet material or during the manufacture of sheet material that will subsequently be slit into tapes. The tape referred to may be a laminate tape for forming a moisture barrier as already described, and as one example of marking during manufacture it is proposed that the metal layer of such a laminate may be marked in-line with the process in which the laminate is formed by the application of a transparent or translucent plastics coating.

85 When the moisture barrier is of aluminium foil pre-coated with a transparent layer of homopolymer or copolymer of ethylene, markings may be applied either to the metal surface or to the polymeric
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surface; in the former case the surface may be treated, if necessary, for example by anodising if it is of aluminium to improve adhesion of marking material. Where ink markings are to be applied to surfaces of polyethylene or polypropylene, corona treatment can be used to improve adhesion.

The following are examples of the invention:—

1. Markings are applied to paper lapping tapes forming the exposed surface of a cable core using an ink printing wheel, and a sheath of natural polyethylene is extruded directly over it.
2. Markings are applied directly to the surface of an aluminium foil moisture-barrier tape polyethylene-coated on both sides using a heated ink printing wheel as sold by Gem Gravure Company Inc. West Hanover Mass. USA under the description Sequential Marker and Printer. The printed tape is applied, in-line with the printing process, to a paper lapped telephone cable core to enclose it and form an overlapped seam; the markings being on the outside, of course. A sheath of natural polyethylene is immediately extruded directly over it so as to adhere to the polyethylene coating.

WHAT WE CLAIM IS:—

1. A multiconductor electric cable having an external sheath of transparent or translucent plastics material wherein markings are directly printed upon a surface of a functional component of the cable so as to be visible through the said external sheath.
2. A multiconductor electric cable having an external sheath of transparent or translucent plastics material applied over a moisture barrier foil wherein markings are directly printed upon a surface of the said foil so as to be visible through the said external sheath.
3. A multiconductor electric cable having an external sheath of transparent or translucent plastics material applied over a lapping tape wherein markings are directly printed upon a surface of the lapping tape so as to be visible through the said external sheath.
4. A cable substantially as herebefore described as example 1.
5. A cable substantially as hereinbefore described as example 2.
6. A method of making a multiconductor electric cable including the steps of directly printing markings upon a surface of a functional component of the cable and completing the cable by applying an external sheath of transparent or translucent plastics material over the said functional component so that the markings are visible through the sheath.

7. A method of making a multiconductor electric cable including the steps of directly printing markings upon a surface of a moisture barrier foil of the cable and completing the cable by applying an external sheath of transparent or translucent plastics material over the said foil so that the markings are visible through the sheath.

8. A method of making a multiconductor electric cable including the steps of directly printing markings upon a surface of a lapping tape of the cable and completing the cable by applying an external sheath of transparent or translucent plastics material over the said lapping tape so that the markings are visible through the sheath.

9. A method as claimed in any one of Claims 6-8 in which the said markings are applied in-line with another cable manufacturing process.

10. A method as claimed in Claim 7 or Claim 8 in which the said moisture barrier foil or lapping tape respectively is marked and then applied to the cable core or to an interposed layer thereon in-line with laying up of the core or the formation of the interposed layer as the case may be.

11. A method as claimed in Claim 7 or Claim 8 in which the said moisture barrier foil or lapping tape respectively is applied to the cable core or to an interposed layer thereon and marked *in situ* in-line with laying-up of the core or the formation of the interposed layer as the case may be.

12. A method as claimed in Claim 7 or Claim 8 or Claim 10 in which the said moisture barrier foil or lapping tape is marked and then applied to the cable core or to an interposed layer thereon in-line with the application of the external transparent or translucent sheath.

13. A method as claimed in Claim 7 or Claim 8 or Claim 11 in which the said moisture barrier foil or lapping tape is applied to the cable core or to an interposed layer thereon and marked *in situ* in-line with the application of the external transparent or translucent sheath.

14. A method as claimed in Claim 7 in which a laminated tape for forming the moisture barrier is marked in advance of its application to the cable.

15. A method as claimed in Claim 14 in which the tape is marked when it is being formed by slitting sheet material.

16. A method as claimed in Claim 14 in which the tape is marked by applying markings to a wide foil which is subsequently slit to form the tape.

17. A method as claimed in Claim 14 or Claim 16 in which markings are applied to the metal layer of a laminate in-line

with the process in which the laminate is formed by applying a transparent or translucent coating to the marked surface.

18. A method as claimed in Claim 8 5 in which the lapping tape is marked in advance of its application to the cable.

19. A method as claimed in Claim 18 in which the tape is marked when it is being formed by slitting sheet material.

10 20. A method as claimed in Claim 18 in which the tape is marked by applying marking to wide sheet material which is sub-

sequently slit to form the tape.

21. A method of making an electric cable substantially as hereinbefore des- 15 cribed as example 1.

22. A method of making an electric cable substantially as hereinbefore described in example 2.

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